

# Rabies Update

## Arizona



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# Rabies Statistics

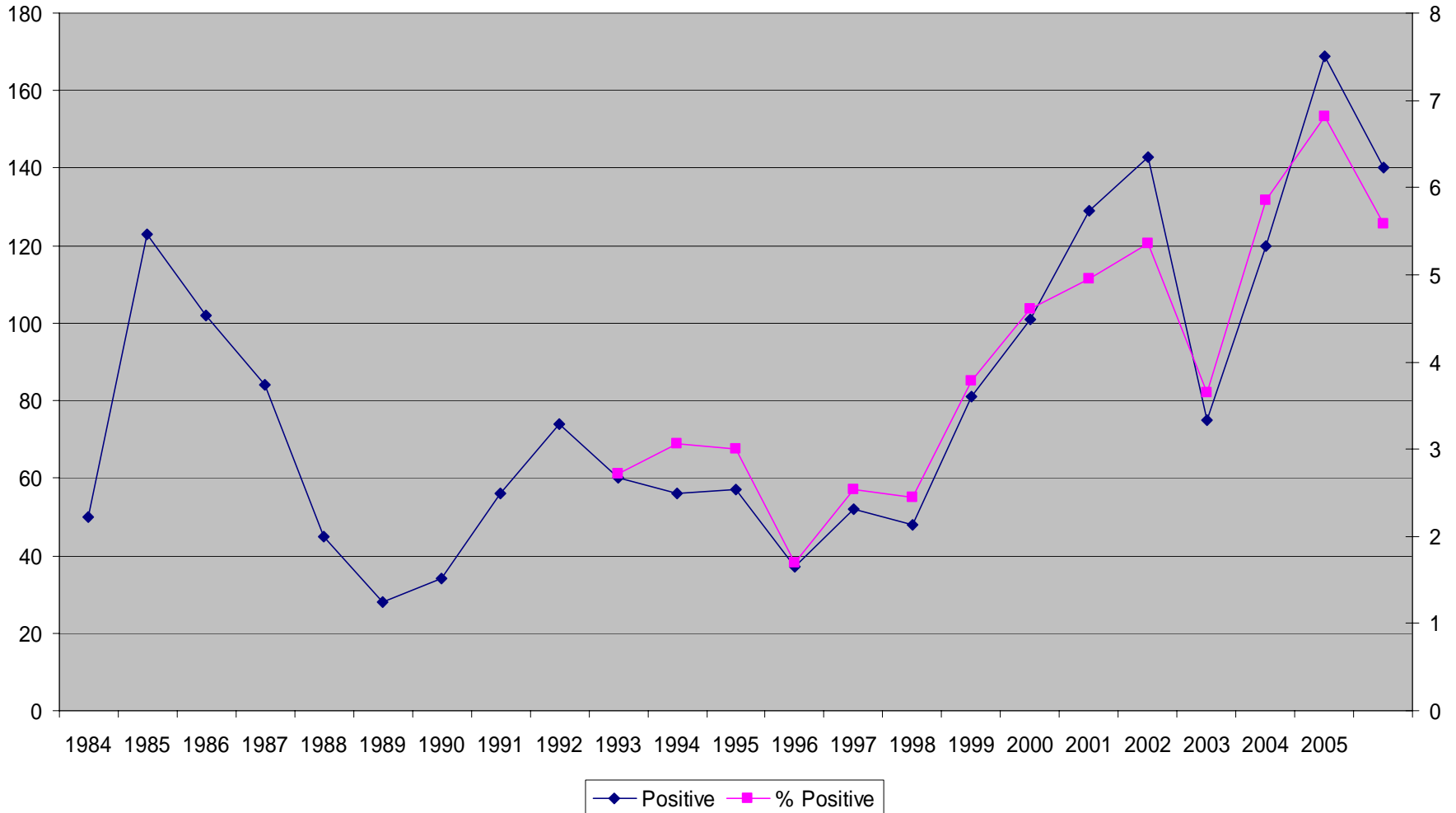


- 2006: 2,598 animals submitted to ASHL
- 2,503 tested
- 2006- 140 positive (5.6%)

Year	Rabid Animals
2001	129
2002	143
2003	75
2004	120
2005	169
2006	140

# Rabies in AZ 1984 - 2006

## Comparison of Positives & Percent Positives



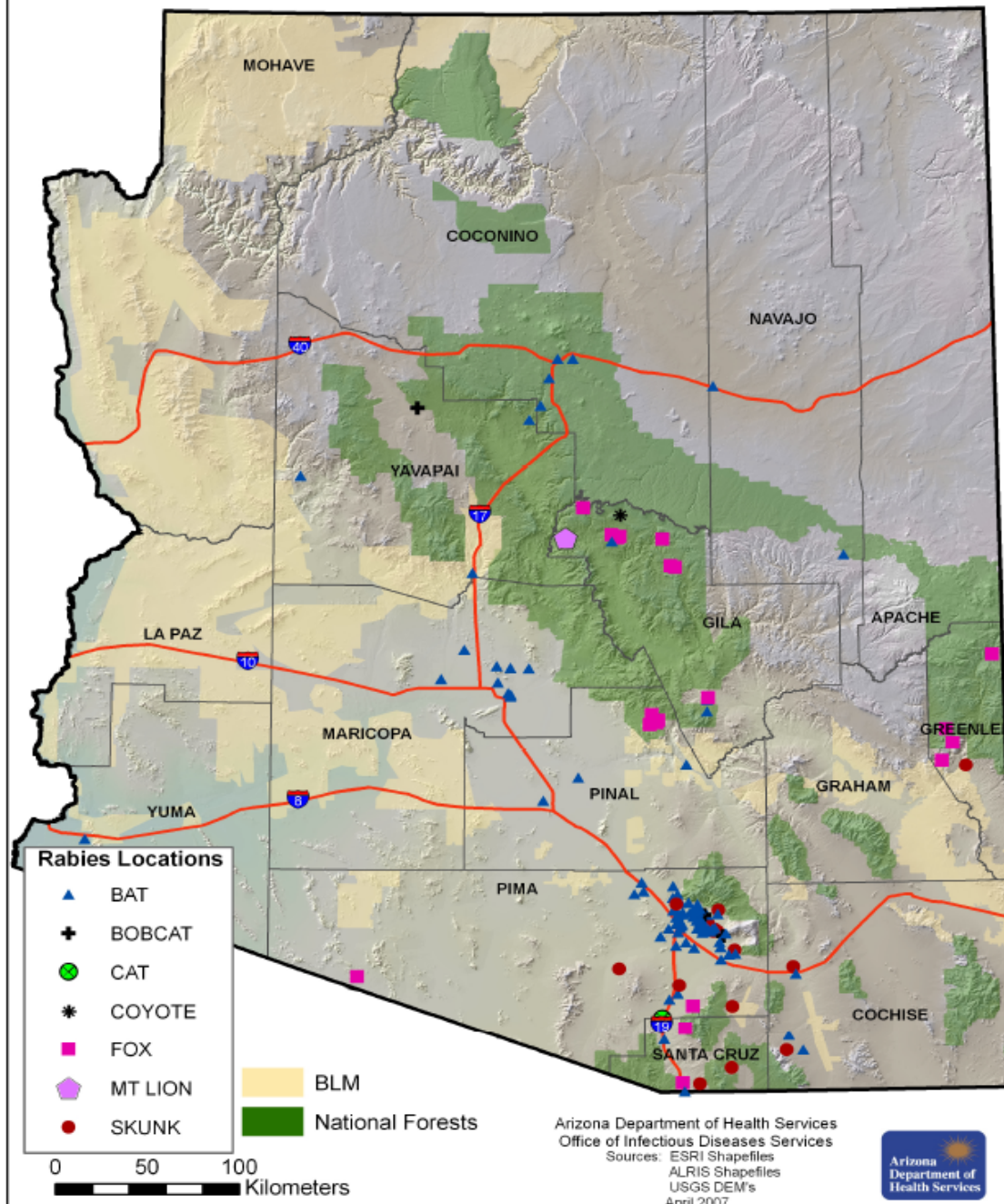
# Lab Confirmed Rabid Animals 2006

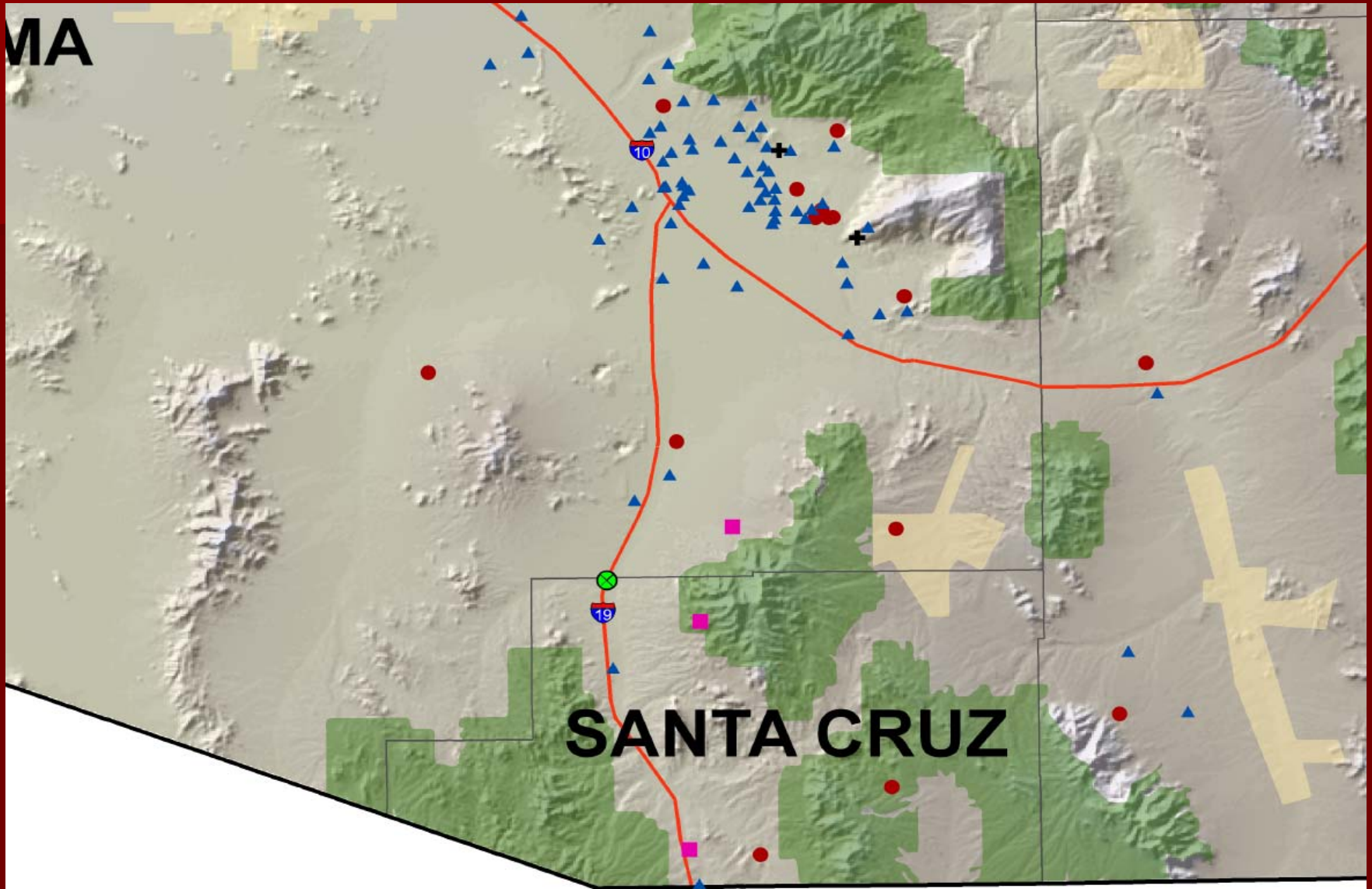
- 96 bats (out of 703 tested) = 13.7% pos
  - (vs. 19% in 2005)
  - Pima County- 66, Maricopa County- 9
- 16 (out of 256 tested) = 6.3%
  - (vs. 67 skunks in 2005)
  - 11 in Pima County – 2005 multi-focal epizootic, quieted down
- 22 fox (out of 36 tested)
  - Gila County – enzootic fox rabies
  - Pinal County – fox rabies epizootic near Superior
  - Greenlee County- Eagle Creek & Blue Range Primitive Area





# Confirmed Animal Rabies Cases, Arizona 2006







# Fox Rabies in Gila County

- April 2006: mountain lion – 16 mi west of Payson
- Stalking a rancher; 6 hunting dogs attacked, none currently vaccinated
- Rancher beheaded mountain lion; received PEP
- 4 months later, rabid fox shot on ranch (lack of fear of humans & out during day)



# Fox Rabies in Greenlee County

- 03/06: 3 fox in Eagle Creek area north of Clifton/Morenci
- 12/06- currently: 4 fox & bobcat in Blue Range Primitive area & Blue River ranching community
- Greenlee County Rabies Control provided education to local ranchers
- In area of Mexican Gray Wolf reintroduction, but all reintroductions vaccinated IM prior to release





# Rabies in Flagstaff

- Variant associated with Big Brown Bat from western U.S. in skunks
- TVR in 2001; 217 skunks vaccinated & tagged
- After 3 years of no cases p/ TVR:
  - 2004 – 5 skunks (60 tested)
  - 2005 – 1 skunk (190 tested)
  - All in Fox Glenn/Continental Estates neighborhood
- 2006 & YTD 2007- rabid bats only



# ORV for skunks

- 1<sup>st</sup> field trial of oral rabies vaccine in skunks
- Vaccinia-rabies glycoprotein recombinant virus inside fish meal coated sachets
- April 2005, Flagstaff: distribution of 1,700 sachets over 22.5 sq. km
- April 2006: repeated over larger area, most of Flagstaff
- 75 baits/ sq. km
- Baiting stations as well



# ORV assessment

- serum antibody levels & bait acceptance of 24 skunks in area & in remote area as control group
- 53 skunks trapped in ORV area
- Only 1 with significant titer ( $>.5$  IU) for rabies



# ORV/TVR in Flagstaff?

- due to lack of cases and insufficient data for support of continuing, ORV will not be repeated in 2007 in Flagstaff
- ORV needs to be further adapted for use in skunks (e.g. vitrefication of vaccine to prevent spillage, develop biomarker for vaccine instead of bait)
- TVR in response to nuisance calls will continue, though limited compared to previous efforts

# Lab Confirmed Rabid Animals

## 2007

- As of April 27th - 26 positive animals
- Easter Sunday- child attacked by bobcat in backyard in Payson, 5 persons receiving PEP
- 2 rabid bats within 1 week @ elementary schools in Maricopa County, with multiple children playing with bat
- 27 children, 4<sup>th</sup> – 6<sup>th</sup> graders receiving PEP





# RABIES ALERT

**WE NEED YOUR HELP** in educating youngsters to stay away from bats and other wild animals. Every year many people in Arizona have to receive rabies prophylaxis after handling bats. The majority of these potential rabies exposures involve children who pick-up and play with grounded bats. Many bat exposure incidents have occurred on school grounds or during school field trips (children commonly bring bats to school for show-n-tell).

Since a significant number of bat exposures have involved school children, we are asking for your help in teaching youngsters to leave bats, and other wild animals, alone. Please have educators within your school district deliver the following important message to children:

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**"STAY AWAY FROM BATS AND OTHER WILD ANIMALS. IF YOU SEE A BAT ON THE GROUND, DO NOT TOUCH IT! REPORT IT IMMEDIATELY TO YOUR TEACHER, NURSE, OR PRINCIPAL. IF YOU OR SOMEONE ELSE TOUCHES THE BAT, OR GETS BITTEN BY AN ANIMAL, BE SURE TO TELL YOUR TEACHER, SCHOOL NURSE OR PRINCIPAL RIGHT AWAY!"**

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Please note: Bats are not aggressive animals. They do not intentionally attack humans. Almost all bites occur when people handle or harass bats. Bat bites can be prevented by teaching people to leave the animals alone. Bats with rabies tend to fall to the ground where children or pets may find them. Any bat that is found on the ground, or that has been caught by a pet or child, should be considered as potentially rabid until proven otherwise by laboratory tests.

Rabies is a viral disease that attacks the central nervous system of its victims and is always fatal once symptoms appear. Rabies can be prevented in persons who have come into contact or been bitten by wild animals through prompt treatment with anti-rabies vaccine and rabies immune globulin. All bite or contact exposures to bats, or other wild animals, should be reported immediately to animal control or health officials!

If a grounded bat (live or dead) is found on school grounds, we recommend the following steps be taken:

1. Immediately take steps to keep people away from the animal.
2. Find out from "witnesses" if anyone touched the bat in any way. If there is human contact (or if there is any doubt), that animal should be tested for rabies at the State Health



# WARNING



**DO NOT  
TOUCH  
BATS OR  
WILD  
ANIMALS!**

**Wild animals may have *rabies*.**

**If you see a bat, do not touch it.**

**Get a teacher or parent for help.**

# ALERTA



**NO TOQUES A  
LOS  
MURCIELAGOS  
O ANIMALES  
SALVAJES!**

**Los animales salvajes pueden tener  
*rabia*.**

**Si observas un murciélago, no lo  
toques.**

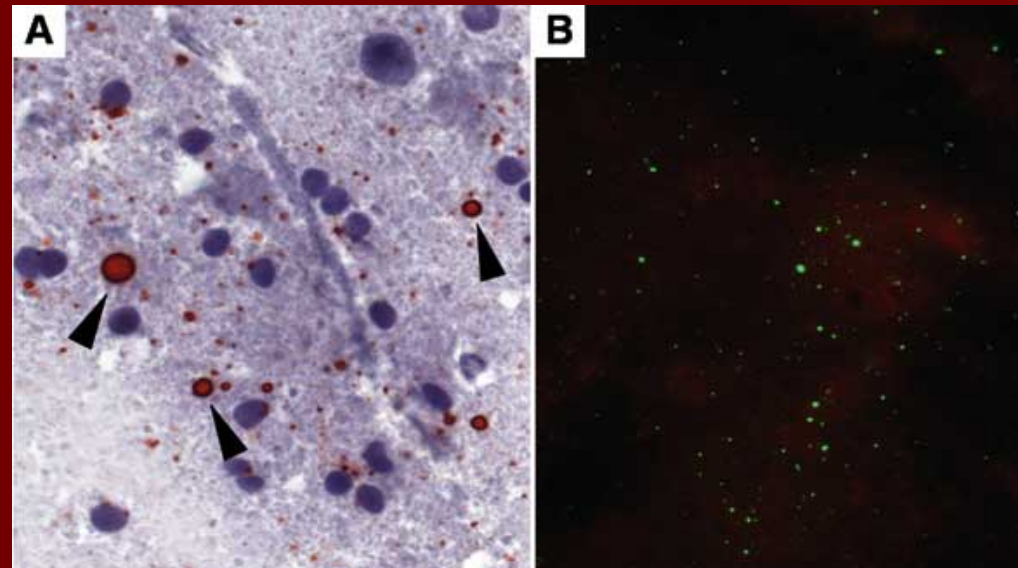
**Busca a un maestro o a uno de tus  
padres por ayuda.**

# New Field Test for Rabies

- Direct Rapid Immunohistochemistry Test (dRIT)
- Developed by CDC, under trial by CDC & USDA APHIS Wildlife Services, for surveillance only
- In AZ, use by USDA APHIS Wildlife Services on wild animals (such as road kills or found dead in national forests/wilderness)
- Cannot be used on animals with direct human or domestic animal contact
- Now used widely for rabies surveillance in raccoons in eastern U.S.

# dRIT vs. DFA

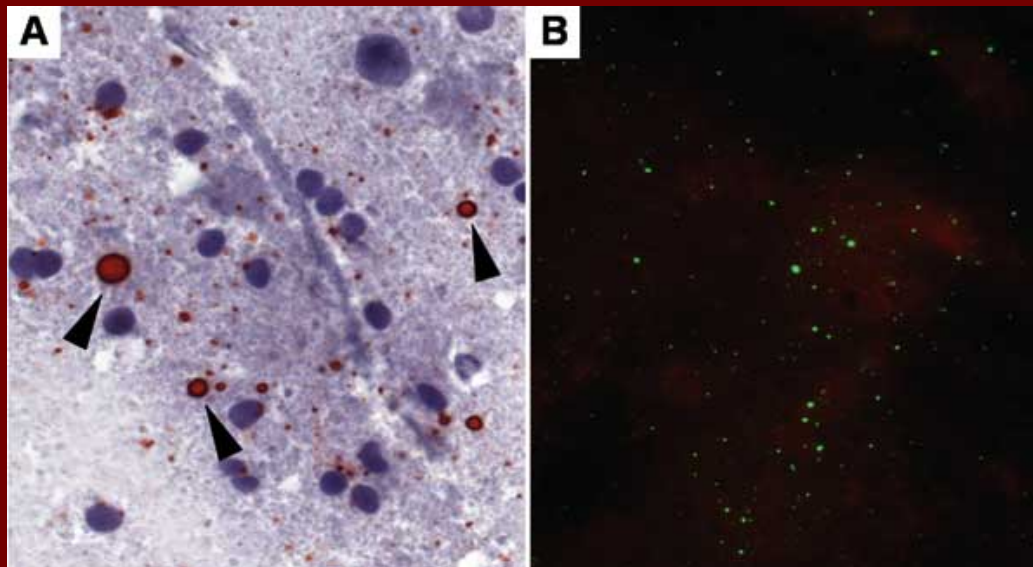
- brain touch impressions as DFA
- light microscopy
- diagnosis <1 hour
- dRIT on glycerol-preserved field samples
- Preservation with glycerol saline - convenient when refrigeration/freezing not promptly available





# dRIT in AZ

- ADHS & wildlife health officials will be discussing how to implement use in remote areas of AZ to enhance surveillance for rabies in wildlife
- Plan to target southeastern AZ & perimeters of known distribution





# Tularemia

- 15 year old male resident of Maricopa County
- Chief complaint of swelling on sides of face & neck for 2-3 weeks
- TX with penicillin by dentist
- No fever, WBC normal, negative for EBV, bartonellosis, toxoplasmosis, TB & cocci
- Blood culture negative
- Biopsy of lymph node positive for *F. tularensis*



# No risk factors

- MCDPH interviewed mother & patient
- No risk factors for tularemia & no travel
- isolate forwarded to Translational Genomics Research Institute (T-Gen North) @ NAU & CDC for subtyping
- CDC reported "F. tularensis non- A, non -B subspecies"
- T-Gen reported *Francisella tularensis* subspecies *novicida* or F. t. related organism

# Is it tularemia?

- Disease caused by non-A & non-B type *Francisella tularensis* is rare
- Bacteria found in soil
- Other case histories in literature describe low virulence with milder presentations, and sometimes lingering symptoms

# Primate Deaths at Zoo



- June 2006: Zoo veterinarian & Arizona Veterinary Diagnostic Laboratory reported acute death of primates
- 06/12: acute death of agile gibbon, with brief onset of neurological illness
  - AzVDL reported amoeba seen on histopathology; forwarded specimens to CDC
- Prophylactic treatment of other primates for amoebas started

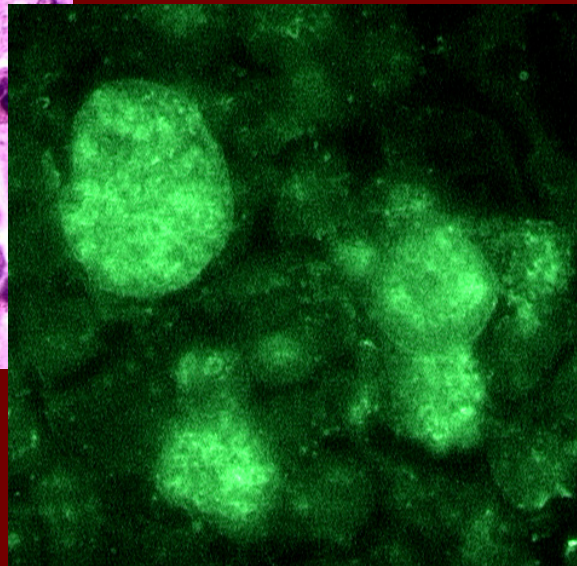
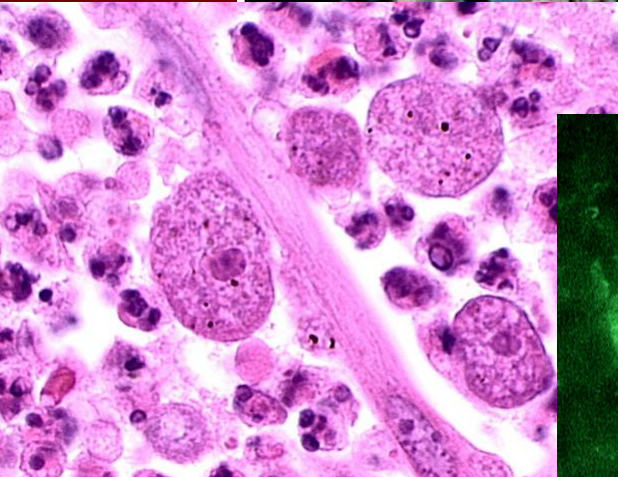
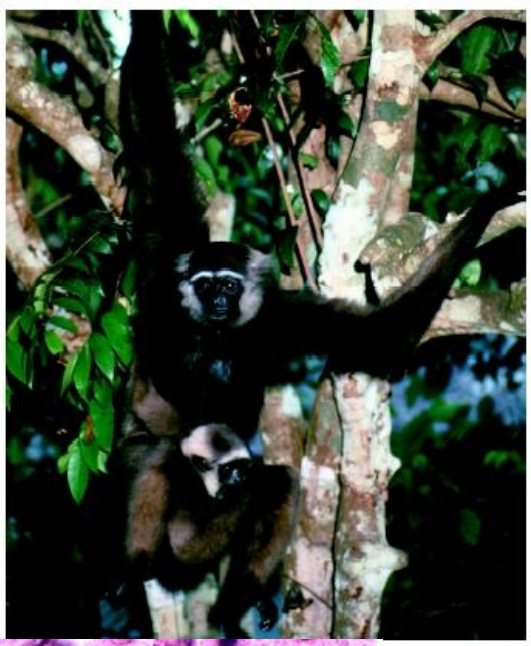
# Tularemia at Zoo



- 06/20: White handed gibbon- depressed, high fever, DIC & sudden death
- Necrotizing enteritis & hepatitis & interstitial pneumonia noted in 2<sup>nd</sup> gibbon
- positive on culture, PCR & DFA for *F. tularensis*
  - liver, lung, spleen +



# Comorbidity



- Management & investigation complicated by different cause of 1<sup>st</sup> acute death of primates
- Agile gibbon: eventually diagnosed with *Balamuthia mandrillaris*, free living amoeba; occipital lobe positive on H&E & IF at CDC

# Tularemia



- 07/05: Siamang gibbon-sudden death after convalescing from mild symptoms 3 weeks prior
  - positive on titer 1:4096
- 07/21: Squirrel monkey found down, dyspnea, died during attempt to treat
  - pleural fluid + on culture & PCR
- deBrazza monkey positive on PCR, but not confirmed

# Response to Tularemia at Zoo

- *F. tularensis* not previously documented in this zoologic collection
- Due to zoonotic disease potential & health threat to animals, preventive measures were initiated by zoo staff, per recommendation of ADHS:
  - Rodent control
  - Fly & ectoparasite control
  - Irrigation of exhibits modified
- N-95 & fit-testing of zoo staff handling sick primates

# Epi Investigation

- 4 staff members of zoo handled primates
  - one symptomatic with respiratory infection
  - All negative on serology for tularemia @ ASHL
- Genotyping of samples from primate (lung, liver, and spleen tissue): *Francisella tularensis* subspecies *holarctica* (type B)
- Type B- not considered endemic in AZ



# Investigation

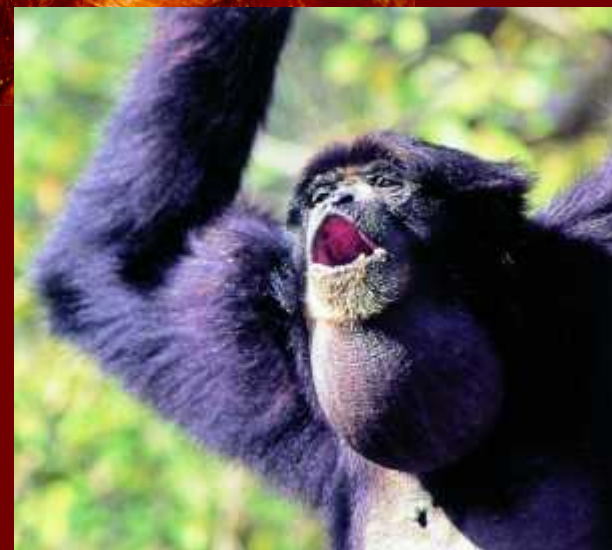
- Tissues from other animals in formalin at AzVDL, with death in months prior to these animals, were sent to CDC for IHC for tularemia (wallabies, lories): all negative on IHC for *F. tularensis*
- However, no tissues available from prairie dogs which were lost prior to and during illness in primates
- Tests on water samples from zoo were negative

# Other Culture Positive Animals

- Wild rabbits from Yavapai County- Dewey, Prescott area
- “Danny”- owned cat in Show Low
- genetic typing from NAU: *F. tularensis tularensis* (Type A2)
- Considered endemic in AZ

# Tularemia at other Zoos

- 2000, other zoo in Maricopa County- *Francisella tularensis* subspecies *tularensis* (type B) infection caused acute death of 6 out of 15 tamarins, 1 marmoset, & 1 siamang at a zoo in Maricopa County
- Consistent histopathology: necrosuppurative enteritis, hepatitis and splenitis



# Tularemia at Zoo in 2000



- Pathology reports & histories implicated ingestion of infected rodents: most likely mode of transmission
- 2 additional tamarins responded to Rx with Amikacin



# Enhanced Surveillance in 2000

- 4% (6/145) of the rodents & rabbits (rock squirrels, cotton rats, round-tail ground squirrels & cottontail rabbits) were infected
- limited samples of mosquitoes, triatomes, & water – negative
- No ticks found in the area
- None of the zoo employees, visitors, or other collection animals developed illness
- 2 exhibit coyotes, 1 feral cat, & 8 petting zoo livestock: significant serologic titers

# 2000 Zoo Outbreak

- no other positive wild animals since initial testing
- Type B tul
- original source of tularemia also remains unknown

# Tuli at Zoos

Year	State	Animals- clinical
1999	CA	capuchin
2000	AZ	15 tamarins, marmoset, siamang
2003	KS	orangutan
2004	SD	tamarins
2005	OR	tamarin, bush baby
2005	CO	deBrazza monkey, rainbow lorries
2006	AZ	siamang, gibbon, squirrel monkey
2006	CA	squirrel monkey, Wied's marmoset
2006	PN	rabbits & woodchucks

# Traceback to other zoos?

- With knowledge of recent tularemia cases in other collections . . . .
- Unfortunately, genes of type B tularemia (*F. tularensis holartica*) well preserved over time
- If outbreak was due to type A (*F. tularensis tularensis*), genetic sequencing may have been more helpful for both investigations

# Why Zoos?

- Trading of exhibit animals between zoos across the U.S. & world frequent & common
- Juxtaposition of reservoir animals & highly susceptible in environment with a setting for transmission
- Some sharing of water sources, attraction of insects and wild rodents & rabbits
- Primates may eat wild rodents or birds entering exhibit
- Good Recipe!!







Questions?





The End



# Arizona Department of Health Services



# Rabid Cat

- Jan 2006
- 6 wk old kitten- 1 of 4 litter mates from Tumacacori
  - Skunk chased kittens 4 weeks prior to onset, only 2 days prior to litter being given to friend in Amado
  - 2 remaining litter mates
  - Multiple dogs exposed to kittens and to original incident with skunk
  - **Skunk variant**
  - PEP – owner & 2 friends



# EID article

- Lembo T, Niezgoda M, Velasco-Villa A, Cleaveland S, Ernest E, Rupprecht CE. Evaluation of a direct, rapid immunohistochemical test for rabies diagnosis. Emerg Infect Dis. 2006 Feb



# ORV for skunks

- persons w/ altered immunocompetence & persons for whom smallpox vaccination is contraindicated (e.g. pregnant, exfoliative skin condition) can have adverse event associated with contact with ORV
- Public education- (press releases, press conference, community meeting, door to door):
  - decrease the possibility of adverse events associated with V-RG
  - Pet owners must keep animals confined so that ORV can be found by skunks and other non-target wild species, instead of pets
  - Increase awareness among physicians & vets

## Skunks and Rabies

Questions and Answers  
About Oral Rabies Vaccine  
Spring 2005



# Adverse Event - ORV

- 44.5 million ORV distributed in U.S.
- Only one adverse event reported
- Ohio 2000 – 28 y.o. pregnant woman with epidermolytic hyperkeratosis
  - Mild abrasion on forearm & puncture of forefinger from dog bite, when tried to remove bait from her dog's mouth
  - Vesicular rash appeared 3 days p/ bite, progressed to 2 cm in diameter, and became necrotic
  - Fasciotomy and excision of necrotic dermis led to large scar
  - Generalized erythroderma, generalized exfoliation on face & neck
  - 34 days for symptoms to resolve, had normal baby
  - orthopox virus morphology found on EM of excised eschar, PCR positive for V-RG



# ORV in skunks – Flagstaff Quarantine

- approved by County Board of Supervisors on April 5<sup>th</sup>, begins on April 17<sup>th</sup> - up to 60 days
- Quarantine area – southeastern Flagstaff (N - Mt. Elden, E - Old Walnut Canyon, W – Schweitzer Canyon Rd, southern city limits,
- Trapping and/or transporting skunks not allowed w/o approval from HD
- All owned dogs & cats must be vaccinated and confined (also - if on walk, leash < 6ft).
- No pet food outdoors after sundown
- Compost & trash containers must be enclosed + skunk & rodent proof
- USDA – lay ORV & trap skunks on private property

